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10/579,720	05/17/2006	Takuji Ikeda	291165US0PCT	3490
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER HOBAN, MATTHEW E	
			ART UNIT	PAPER NUMBER
			1793	
			NOTIFICATION DATE	DELIVERY MODE
			06/10/2009	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/579,720	<b>Applicant(s)</b> IKEDA ET AL.	
	<b>Examiner</b> Matthew E. Hoban	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) 9-14, 22-26 and 34-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 15-21 and 27-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/17/2006</u> . | 6) <input type="checkbox"/> Other: _____  |

***Election/Restrictions***

1. Claims 9-14, 22-26 and 34-43 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected embodiment, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 2/12/2009.

2. Applicant's election with traverse of Claims 1-8, 15-21 and 27-33 in the reply filed on 2/12/2009 is acknowledged. The traversal is on the ground(s) that the claims have not been interpreted in light of the specifications and that the claims are integrally related. This is not found persuasive because the two groups of claims are directed at totally different subject matter where the claims of Group II do not recite the use of the product of group I in the production of the product. The product claimed in Group II's base claims is known within the prior art. For example, the zeolite of claim 9 is known within the prior art and is designated as Si-CHA, which is a synthetic pure zeolite having a porous structure. This structure has the formula  $\text{Si}_{36}\text{O}_{72}$ , and thus the zeolite of Group II is not integrally linked to Group I since this zeolite can be made by plural and diverse means. Thus there is no unity of invention between the two groups and these two groups are not seen as being of different scopes of the same invention for these reasons. (See articles by Olson and Hedin; specifically, Section 3.1 of Olson, and Section 3 of Hedin)

The requirement is still deemed proper and is therefore made FINAL.

***Claim Rejections - 35 USC § 102/103***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

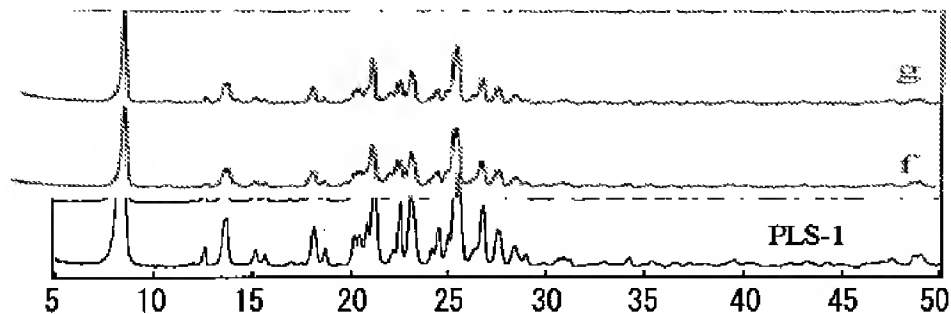
6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

Art Unit: 1793

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claim 1-8 and 15-21 rejected under 35 U.S.C. 102() as anticipated by Kooli in his publication entitled "Novel layered silicate and microporous silica materials in the Na-magadiite-H<sub>2</sub>O-(TMA)<sub>2</sub>O system".

**Regarding Claim 1:** Kooli teaches a silicate layered structure formed from Na-magadiite, water, and TMA. The synthesis route as outlined by Kooli produces materials through various reaction temperatures and reagent proportions. The product of Kooli are elucidated in Figure 1 through XRD patterns. These XRD patterns have the same peak positions, and relative intensity to one another as is seen in Figure 14 of Applicant's spec as is compared below. Similar results for different reaction temperatures and times are also shown in the prior art of Kooli.



Comparison of Figure 14 of Application (PLS-1) and Figure 1 of Kooli (g, f).

Since the XRD patterns of the prior art and the instant application are exactly the same in peak position and relative intensity, then it must also be true that the composition, bonding nature, and the lattice spacing associated with  $2\theta$  of both materials are the same. Even when the tables of the diffraction data are taken with the same error bars as those used in the claims, the difference between those values claimed and those seen in the prior art is statistically insignificant.

XRD is a measure of the lattice parameters of a crystalline material. Thus, compositional or structural differences cause drastic change in both the peak positions and intensities of XRD. Thus, since the prior art clearly shows the same XRD pattern as that which is claimed, it must follow that the composition of the prior art would necessarily be the same as that which is instantly claimed.

Furthermore, the presence of covalent bonds between Si and O atoms must also be present as the nature of bonds would also change the XRD pattern of the material as the bond length contributes to the lattice parameters.

Kooli speaks about the structure of his layered silicate at the top of the second page of his teachings. He states that the structure is made up of cups of half sodalite cages facing up and down in an alternating fashion. Sodalite cages inherently have a

Art Unit: 1793

nanoporous nature being that they are six member rings of 2.84 angstroms in size (See Abstract of evidentiary document attributed to Yao)

**Regarding Claim 2:** Kooli shows that the FLS phase is rich in tetracoordinated Silica and also contains tricoordinated silica. See section entitled “NMR data”.

**Regarding Claim 3:** At the beginning of the second page of the reference, Kooli states that TMA ions are incorporated into the cup-shaped cages of the planar silica with Na and water molecules located between the two silicate layers as well. This structure is shown to be same in the current work as is shown in the last paragraph of the study on Thermal properties, where Na cations and water coordinated thereto are eliminated from the structure, causing collapse, meaning that these structures were between layers. Throughout the teachings, TMA is said to be intercalated and thus between layers.

**Regarding Claim 4:** Kooli states that the initial basal spacing is 1.53 nm, which is increased to 1.8 nm after reaction with TMA cations (See section entitled “Effect of Reaction temperature”). 1.8nm is greater than 3 angstroms.

**Regarding Claim 5:** Kooli states that the IR data for FLS includes stretching bands which are characteristic of five-membered rings in zeolites (See section entitled “Infrared spectroscopy”).

**Regarding Claim 6-7:** Kooli's method of making the layered silicate described above is shown in the Synthesis section. This method includes mixing Na-magadiite (a crystalline layered compound), with water and TMAOH (structure directing agent), and then heating the mixture using an autoclave. The product of this process was previously explained in reference to claim 1. It is noted that in this explanation that the XRD pattern of Kooli's crystalline layer compound was matched with that of the instant application and thus the composition and structure' of this composition must be the same as that which is claimed.

**Regarding Claim 8:** Kooli makes use of a tetramethyl ammonium salt.

**Regarding Claim 15:** Kooli shows a method in his section entitled Synthesis, where the obtained layered silicate is calcined at a temperature between 300 and 800 C to obtain a product. In the section entitled Surface Area and microporosity, Kooli shows that upon calcination of the FLS material at 500C, a microporous zeolite material is formed. The process of calcination is seen as a dehydration step and the polycondensation of the compound is evident from the creation of micropores . The transformation of the layered silicate into three dimensional structures is also noted in the final page of Kooli's teachings. Thus polycondensation must be occurring during this calcination process.

Art Unit: 1793

**Regarding Claim 16:** Kooli uses adsorption measurements which integrally include a step of outgassing the zeolite at 200C at 10<sup>-3</sup>Pa, which is 7.5e-5 torr (See Characterization Section). Although Kooli does not explicitly speak of the effects of this preparation step, this degassing would integrally include the degassing of water adsorbed to the sample and thus be considered further dehydration. Therefore, this characterization step reads on the claims as currently recited.

**Regarding Claim 17 and 19:** Kooli shows the creation of zeolites after calcining the precursor at 500C.

**Regarding Claim 18:** Kooli explains that the calcination is performed in air, i.e. at normal atmospheric pressure (See Synthesis Section).

**Regarding Claim 20:** Kooli teaches a heating rate of 3C per minute (See Synthesis section).

**Regarding Claim 21:** Kooli teaches calcination in air, which is a combustion supporting gas comprising oxygen molecules.

8. Claims 27-33 rejected under 35 U.S.C. 103(a) as being unpatentable over Kooli in his publication entitled "Novel layered silicate and microporous silica materials in the

Art Unit: 1793

Na-magadiite-H<sub>2</sub>O-(TMA)<sub>2</sub>O system” as applied to claim 8 and 15 above, and further in view of Deckman in 7049259

**Regarding Claim 27:** Please review the previous 102/103 rejection over Kooli. Kooli teaches a method of synthesizing a silica-based zeolite material from Na-magadiite.

Kooli is silent as to practical uses and orientations for his zeolite.

However, Deckman teaches a method by which zeolites can be incorporated into a porous or nonporous inorganic membrane (See Column 6, Lines 25-35; abstract). This support may be porous glass, sintered steel, alpha alumina and other inorganic oxides. A zeolite layer is formed on either or both sides of this support. Deckman shows that spin coating on the layer is especially advantageous and can be accomplished with a wide range of molecular sieves, Where this can be done either by directly depositing the particles or by hydrothermally growing layers on the substrate using seeds (See Column 7 and 9). If this second method is used calcination is necessary. Thus after post processing, a membrane structure with one or more zeolite layers is formed.

It would have therefore been obvious to one of ordinary skill in the art at the time of invention to utilize the material of Kooli in the formation of membranes, such as

Art Unit: 1793

suggested by Deckman, motivated by the fact that Deckman teaches that zeolites can be used efficiently as both gas separation membranes as well as for catalysis in a membrane orientation. Deckman's process thus enables one of ordinary skill in the art to utilize Kolbe's zeolite in both of these manners.

One would be motivated to combine these references based on the porous and siliceous nature of the zeolite and would obviously see the application of Deckman as practical and advantageous.

The final product of Kooli's zeolite in the preparation of Deckman would necessarily be CDS-1 having the claimed pore structure. The precursor is of the same composition and structure, thus the polycondensation of such a precursor would yield the same final product.

**Regarding Claim 28:** The SEM observation section of Kooli notes the FLS crystals are nucleated and thus nucleation must occur from a seed. These seeds form into needles, and concurrently form platelets which stack together. Thus the initial non-sintered membrane is a PLS membrane formed from seed particles. These seeds are developed through a hydrothermal method using both an organic template and sodium from the Na-magadiite. The method used by Deckman to form membranes is also useful under hydrothermal conditions thus making the means of making Kooli's zeolite highly combinable with the production method of Deckman. This hydrothermal process

Art Unit: 1793

as taught by Kooli should be between 160-180 degrees to create FLS, which is the only zeolitic sintered product as discussed previously.

**Regarding Claim 29:** Kooli is silent as to useful substrates for membrane creation; however, Deckman teaches that either porous or nonporous substrates are useful.

**Regarding Claim 30:** The means of calcining as taught by Kooli is at 500C, which forms three dimensional networks from the formerly intercalated layers. This collapse of the crystals must necessarily be by the same method of condensing Si-Oh groups. The final product must also necessarily be the same and be CDS-1

**Regarding Claim 31:** Kooli is silent as to the membrane creation process; however, Deckman teaches that during membrane creation using spin coating it can be advantageous to apply the liquid at reduced pressure or elevated temperature. Thus it would be obvious to one of ordinary skill in the art to heat the membrane at reduced pressures during spin coating in order to increase the penetration of the liquid as taught by Deckman (See column 50-55).

**Regarding Claim 32:** Kooli teaches optimal synthesis of FLS, the precursor for his zeolite crystals, at 16—180 C (See Effect of reaction temperature section).

Art Unit: 1793

**Regarding Claim 33:** Deckman teaches that a seeding technique can be used to make the membrane layer. He explains this at Column 9 Lines 5-50. This method basically includes the seed of the zeolites being included in the hydrothermal solution. Further, hydrothermal solution is added to these seeds to promote layer growth. Therefore, as this method is applied to creating a layer of Kooli's zeolite, the final calcined zeolite would be used as seeds, and the initial solution would then be added to these seeds to form the layer. Thus secondary growth from the hydrothermal solution would occur.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Hoban whose telephone number is (571) 270-3585. The examiner can normally be reached on Monday - Friday from 7:30 AM to 5 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1793

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.A. LORENZO/

Supervisory Patent Examiner, Art Unit 1793

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